

Heredity in Corn – A Living Necklace

Purpose: Students will understand the importance of corn as a crop. Students will use corn to model plant reproduction and also plant heredity.

Time: 1 hour – on-going

Level: 3

Materials:

- Crop pictures (included at the end of the lesson)
- Dent corn (AKA field corn) seed for each student
- Indian corn seed for each student
- Ear of corn samples – dent corn and Indian corn if possible
- Notebook or journal for each student
- Cotton balls – 1 per student
- 1 small plastic jewelry bag for each student
- Yarn
- Water
- Hand lens – 1 for every 2 students
- Metric ruler – 1 for every 2 students
- Permanent markers

Optional

- *Commodity Cards from Minnesota Agriculture in the Classroom*

<http://www.mda.state.mn.us/kids/commoditycards.aspx>



Minnesota Science Standards and Benchmarks

3.4.3.2.1 Give examples of likenesses between adults and offspring in plants and animals that can be inherited or acquired.

3.4.3.2.2 Give examples of differences among individuals that can sometimes give an individual an advantage in survival or reproduction.

Minnesota Math Standards and Benchmarks

3.4.1.1 Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.

Minnesota/Common Core Language Arts Standards and Benchmarks

3.6.4.4 With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose.

Background

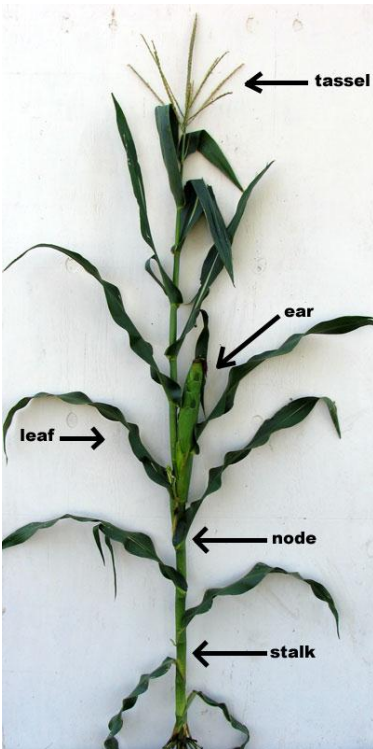
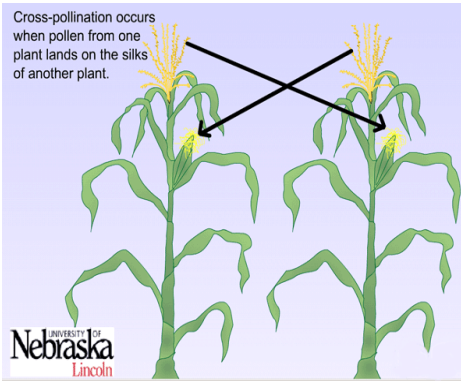
Corn is one of the world's major grain crops. It is the largest grain crop grown in the United States. Minnesota ranks fourth in the US for corn production. Corn is a valuable food source for humans as well as livestock. Humans consume sweet corn which has soft kernels and a higher sugar content. Livestock consume dent corn (also known as field corn) as whole kernels or in corn meal. Corn serves as an excellent carbohydrate source for livestock animals. Dent corn is also used in human food products such as corn meal, cooking oils, margarine, corn syrups, and sweeteners (fructose).

Corn is grown by planting a singled seed (or kernel) of corn. This kernel develops into a plant that contains both the male and female parts of a plant. The female part of the corn plant is found in the shoot that will develop into the ear of corn – the ear shoot. The male part is called the tassel and is found at the top of the corn plant. The tassel holds pollen. This pollen is transferred to the female ear shoot that contains 750-1000 ovules that each produce a silk. If a pollen grain reaches a silk then a kernel will develop. Each kernel that develops on an ear of corn is a separate individual with different genetics. However, the kernels on an ear of dent corn will all look very similar because plant geneticists and crop scientists have done years of plant breeding and selection to limit the trait variation. Farmers want to produce the corn with the highest yields (production) and also plants that can survive droughts, resist insects and disease, and have the same number of days to maturity. For these reasons, there is limited variation in the offspring (kernels) produced.

Another type of corn, Indian corn, is produced mainly for decoration in Minnesota. Variation in color and pattern of kernels is desired for fall decorations and Thanksgiving centerpieces.

Students will compare these two varieties of corn and use them to exemplify heredity.

Procedure



1. Tell students to look around the room. Ask students:
 - a. What differences do you see in your classmates? (hair color, eye color, skin color, height, foot size, etc.)
 - b. Why don't we all look the same? (genetics from our parents)
2. Pair-up students and give each pair a picture of a crop produced in Minnesota. Print-out the attached pictures so each pair of students has a picture. Ask students:
 - a. What differences can you see in the plants in your picture? (*none – all the plants look the same*)
 - b. How does this variation compare to what we see between people in this room? (*much less variation in the crop plants*)
 - c. Why do you think all of the plants look the same in your picture? *Uniformity is important to Minnesota farmers. Plant researchers and genetic scientists have developed crop seeds with traits that grow plants that:*
 - i. *all mature at the same time to make it easier to harvest*
 - ii. *Are resistant to insects and diseases*
 - iii. *Are tolerant to drought or other environmental conditions*
 - iv. *Produce the highest yield possible.*
 - d. Brainstorm with students why these traits are helpful to farmers and to consumers.
3. Give each group of students a picture of an ear of corn or an actual ear of corn if available. Use the Minnesota Agriculture in the Classroom commodity card for corn to share some facts about corn grown in Minnesota with the students. Ask each pair of students to make a chart of similarities and differences between the kernels on their ear. As a class discuss their observations. (*Dent corn kernels on one ear will all be very similar. Indian corn kernels on one ear will most likely be very different.*) Compare the traits of the two corn varieties. *Teaching Tip: If you do not have ears of corn available have students compare all of the dent corn seeds and all of the Indian corn seeds they will germinate.*
4. Use the background information to explain to students that each kernel is an individual offspring of the plant that produced the ear – just like each child is an offspring of its human parents. A corn plant has about 600 babies (kernels) at once and they are all found on the same ear!
5. Tell students that they will now take one kernel (one baby) from dent corn and one kernel from Indian corn and investigate the traits that it has by allowing it to grow.
6. Give each student a dent corn kernel and an Indian corn kernel. Also ask each student to get a notebook ready. Ask each student to begin his/her corn journal by drawing a picture of each seed and writing several sentences to describe it in his/her notebook.



7. Demonstrate the process of making a living necklace to the students:
 - a. Punch a hole in the top of a small jewelry sized plastic bag.
 - b. With a permanent marker, label one side of the bag with a "1" and the other side with a "2"
 - c. Dip a cotton ball in water. Give the cotton ball three "flat" squeezes to remove excess water.
 - b. Place the cotton ball inside the plastic bag.
 - c. Place the dent corn kernel on the side of the bag with a 1 and the Indian corn kernel on the side of the bag with a 2. The kernels should be in contact with the dampened cotton ball.
 - d. Tie a string or piece of yarn through the hole punched in the top of the plastic bag. Wear the string and bag like a necklace.

DO NOT close or seal the plastic bag – the seed needs air to sprout!

The seeds should soon swell up from the moisture and germination should take place in about three days.

8. Assist students in making their necklaces and encourage them to wear them – the body heat assists in germinating (sprouting) the seed.
9. Each day have students record in their journals the changes they observe in their seeds. Use hand lenses to observe the roots and leaves as they emerge and grow. Use rulers to measure the length of roots and leaves as they grow. Include information about observable traits such as:
 - a. Number of days from "planting" until the root and the shoot can be seen
 - b. Root length
 - c. Color of growth
 - d. Number of leaves and roots

10. Have students make charts and graphs of their daily data for measurable traits (leaf and root length).

Use the individual student data to create class charts and graphs for as many traits as possible (growth, color, etc.)

11. Compare and contrast the variation present among the dent corn kernels and also the Indian corn kernels.

Teaching Tips: The dent corn kernels should all have very similar growth patterns and traits. If there is several that are not similar discuss what environmental conditions could have caused variation. Also discuss the impact that both genetics and environment have on living things. The Indian corn kernels should have a lot of variation in their traits. If this isn't the case, once again discuss how environment could have impacted the variation that is observed. The corn seeds will sprout in 3-6 days. Planting them on a Friday and making the first observations on Monday is a quick way to "jump start" this activity.

Additional Activities

- Grow Wisconsin Fast Plants, either for a week to observe germination and daily growth, or for a full life cycle of approximately 40 days. Seeds can be purchased on line. <http://www.fastplants.org/>
- Incorporate stories and other materials from Native American history such as the story of the three sister crops – corn, beans and squash.

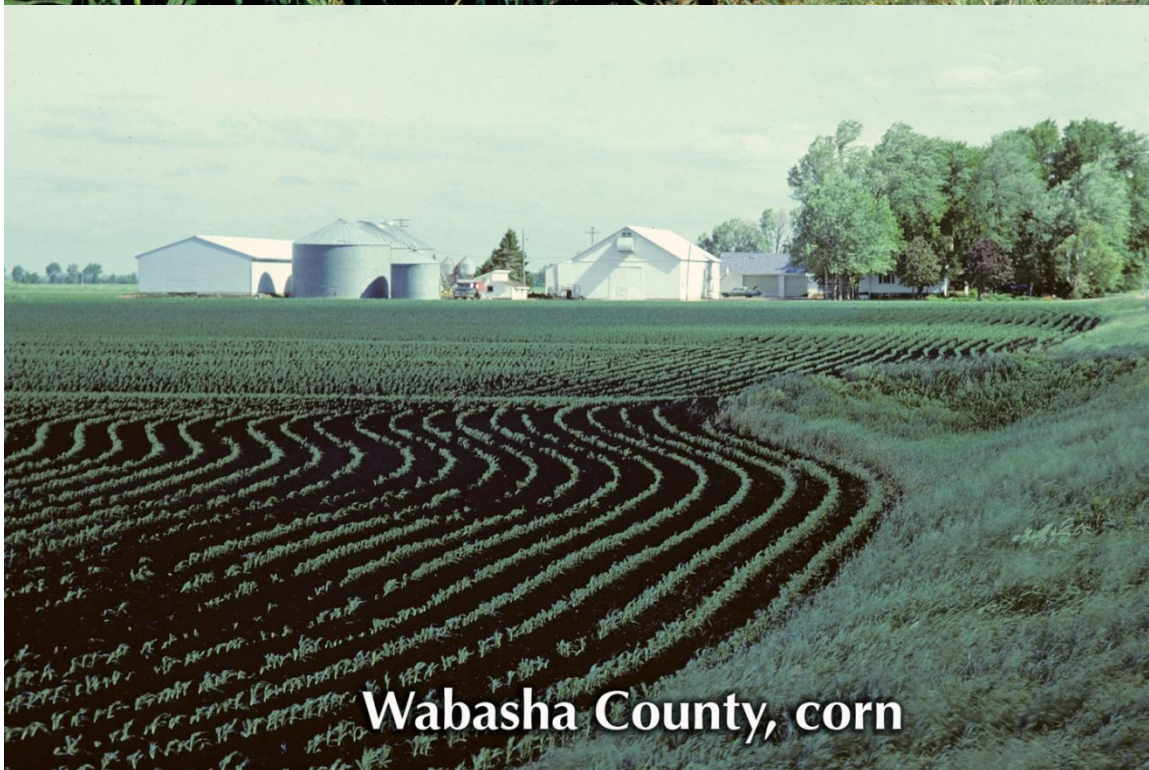
- Assign students to compare similarities and differences in traits among plants of a species growing in the wild and plants of another cultivated species.

Resources

- Dent corn and Indian corn can be obtained from local farmers or purchased at garden centers.
- The Minnesota Corn Growers has a wide variety of information about corn production in Minnesota.
<http://www.mncorn.org/>
- Minnesota Agriculture in the classroom has a 1:35 minute video that highlights a farm family in Minnesota that produces corn.
<http://www.mda.state.mn.us/kids/videostories/feedus.aspx>

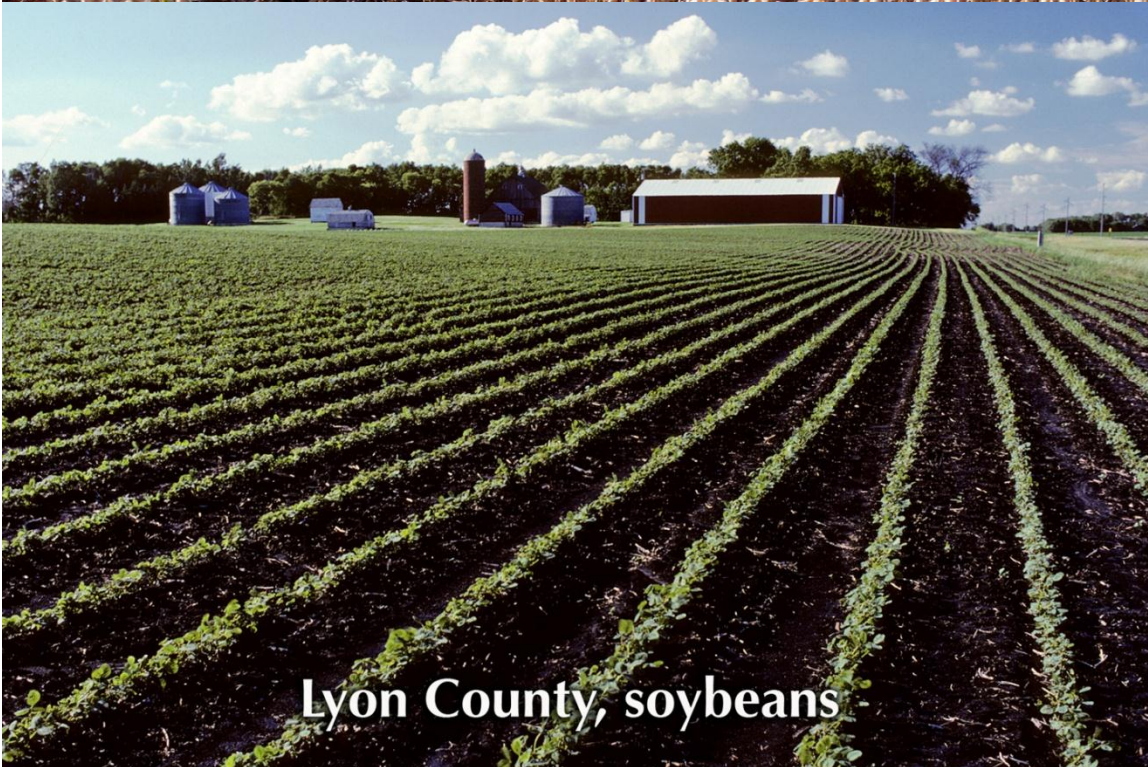
Adapted from Utah Agriculture in the Classroom.

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Nobles County, soybeans



Lyon County, soybeans



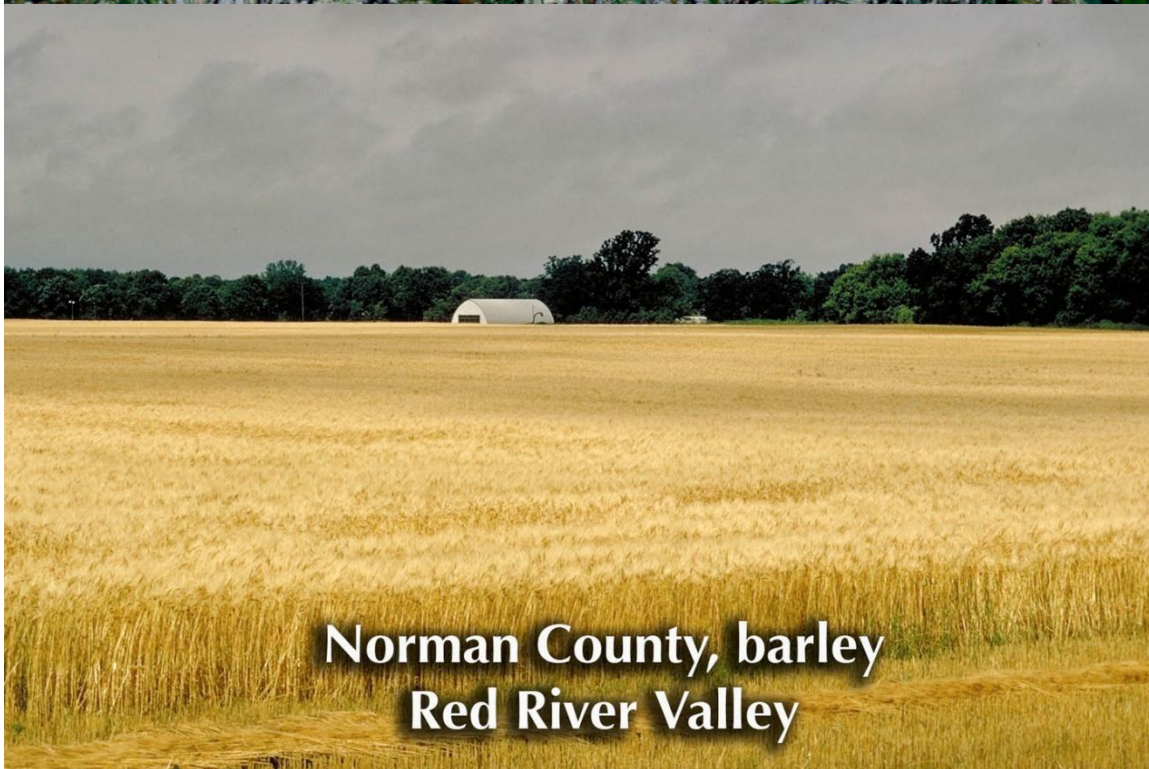
Douglas County, wheat on organic farm



Clay County, sunflowers



Aitkin County, cultivated wild rice



**Norman County, barley
Red River Valley**